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AUTHOR Bright, Larry K.; And Others
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ABSTRACT

Teacher education can be effectively transformed to prepare educators for the information age. The characteristics of the information age require the application of organization development processes and interactive learning technologies which bring the best results of behavioral and engineering sciences to refocus teacher education structures and methods of instruction. Two applications of science have profound implications when applied together in a process for change. The first--Organization Development Process--has grown from four decades of human behavioral research on the improvement of the structure and leadership of organizational behavior to produce significant growth in interdependent goal behavior. The second--Interactive Videodisc Teaching--has resulted from engineering research which has achieved the capability to retain the human dimension in interactive videodisc software through linkage of the computer, video, audio, and instructional design. This paper reports the features of the change process, research results on formative change, and implications for American and international education. (Author/JD)

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TECHNOLOGY IN PREPARING TEACHERS FOR AN INFORMATION AGE

Prepared by

Larry K. Bright, Ed. D., Dean of the College

Helen L. Carlson, Ph. D., Department Head

Eugene E. Grossman, Ph. D., Center Director

Terrie M. Shannon, Ph. D., Center Director

COLLEGE OF EDUCATION AND HUMAN SERVICE PROFESSIONS

UNIVERSITY OF MINNESOTA, DULUTH

125 Bohannon Hall

Duluth, Minnesota 55812

United States of America

(218) 726-7131

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TECHNOLOGY IN PREPARING TEACHERS FOR AN INFORMATION AGE

ABSTRACT

Teacher education can be effectively transformed to prepare educators for the information age. The characteristics of the information age require the application of organization development processes and interactive learning technologies which bring the best results of behavioral and engineering sciences to refocus teacher education structures and methods of instruction. At the University of Minnesota, Duluth, the College of Education and Human Service Professions has applied these combined technologies in a planned change process to renew faculty and curricula. Matrix College organization structure, with four curriculum development centers across six human service education departments, and redirected faculty energies toward production of instructional enrichment through interactive videodisc applications, have created documented change in organizational characteristics. The College reports the features of the change process, research results on formative change, and implications for American and international education.

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TECHNOLOGY IN PREPARING TEACHERS FOR AN INFORMATION AGE

For the necessary transformation of teacher education to prepare educators for the information age, two of this decade's "technologies," or applications of science, have profound implications when applied together in a process for change. The first--ORGANIZATIONAL DEVELOPMENT PROCESS--has grown from four decades of human behavioral research on the improvement of the structure and leadership of organizational behavior to produce significant growth in interdependent goal behavior. The second--INTERACTIVE VIDEODISC TEACHING--has resulted from engineering research which has achieved the capability to retain the human dimension in interactive videodisc software through linkage of the computer, video, audio, and instructional design.

Matching Change Technologies to Information Age Demands of Teacher Education

Applied for mutual influence in a college of teacher education, these two technologies can have important implications for resynthesis of both thought and practice. Teacher education curricula and departmentalization which may have become artificially differentiated and specialized are required to be reconceptualized, as organizational behaviors and group affiliations are planned systematically in organizational development processes. The production of multi-sensory software with the branching necessary for quality interactive videodisc presentation requires the application of cognitive field theory which demands that the linear, scope and sequence controls of past instructional planning be transcended with gestalt conceptualization.

Organization of This ICET Paper and Presentation

Prepared for presentation at the Thirty-Second World Assembly of the International Council on Education for Teaching (July, 1985, in Vancouver, British Columbia), the primary focus of the paper is to report the characteristics and effects of three years of organization development and interactive videodisc technologies on the College of Education and Human Service Professions at the University of Minnesota, Duluth. The effects have brought about continuing change in faculty scholarship and work activity, classroom methods for individualizing instruction, core curricula requirements, program standards, international linkages and curriculum, college climate, and the College goals and philosophy of education.

Perspectives on the needs in education and learning in an information society are summarized, followed by a call for transformation of teacher education. The use of non-linear, cognitive field theory, part of both organization development processes and interactive videodisc production, is discussed briefly. The basic features of organizational development and interactive videodisc production and uses, and the integration of these technologies into a long-term change process, are outlined. A description of specific characteristics of organizational structures are provided for one department of the College, as an example of the effects of technology.

College centers for advancement of learning technologies and curriculum change are described, with focus on their design across specialized departments to create faculty mutual influence and a climate of scholarly search

for new behaviors for coping with knowledge expansion, new learning technologies, declining financial and personnel resources, changing cultural attitudes toward schooling, and contemporary international conditions. Continuing formative results of descriptive and analytical research on the effects of the change are described, with summary of the results of 1982-1985 pre-post testing of faculty skills and attitudes, organizational changes, and organizational characteristics.

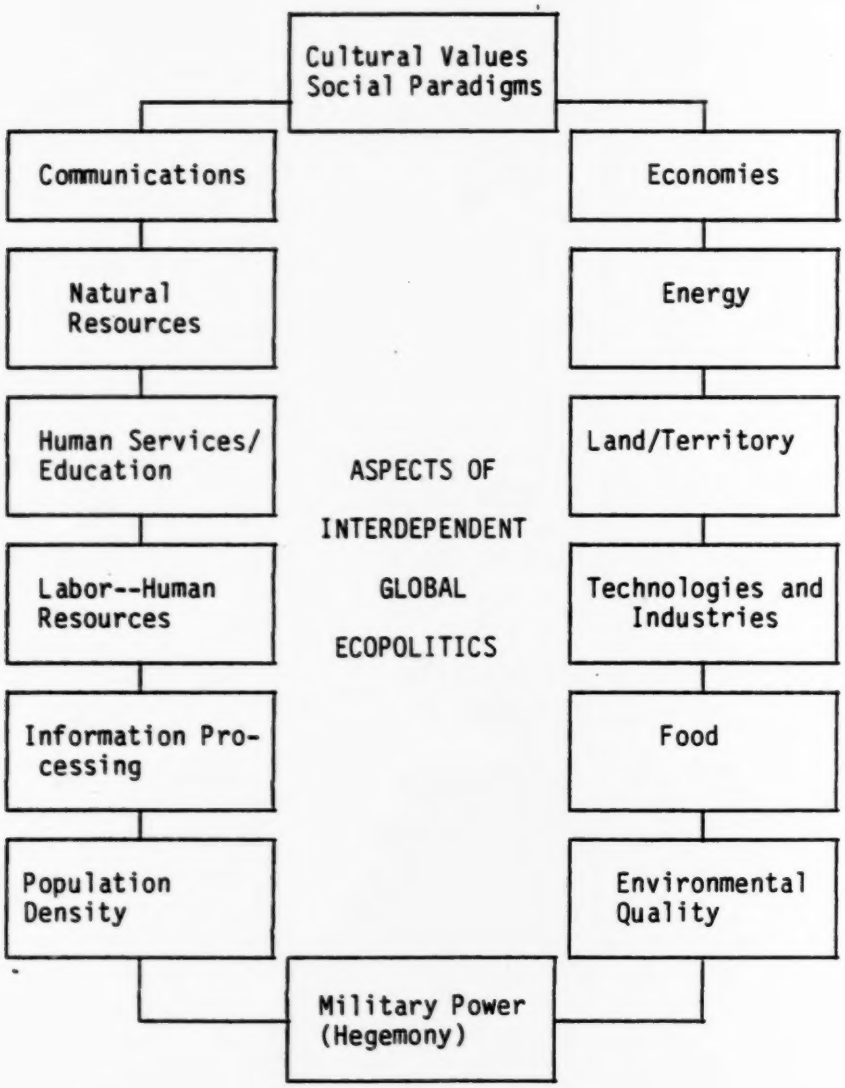
The positive impact of paired organizational and interactive learning technologies in this university teacher education unit has been documented, with change in productivity, formalization, morale, interpersonal relationships, willingness to attempt innovation, centralization, knowledge and skills for individualization of instruction, sensitivity to needs of the handicapped, scholarship, and consensual behavior for redirecting the philosophy of the teacher education unit. The severe negative financial, and organizational contexts in which the change process was implemented are not described in this paper, but these conditions are available to the reader in a complementary paper entitled "Catalysts for Building a College of Education and Human Service Professions," available in ERIC Reports of 1985.

The writers invite colleagues with similar interests and projects for action to reconceptualization of teacher education organizations and processes to also share results and characteristics of their applications of science in improving practice and theory. The challenge and importance of employing results of rapidly evolving bodies of knowledge and technology in teacher education makes this decade one of the most rewarding.

Facing Teacher Education Change in a World of Forced Propinquity

Interdependence among world social and eco-systems requires understanding. The information age has created a world of forced propinquity. Figure 1 displays some of the interdependent forces of global ecopolitics:

Figure 1. Aspects of interdependent global ecopolitics.



There is little choice today but to try to learn to empathize with one's international neighbors. The individual can no longer live comfortably in isolation or ignorance of world-wide scarcities of energy, food, or in fear of military crises. A person not aware of the significance of the potential impact of these forces in the world has highly reduced capacity for critical consciousness. To share in the burdens and benefits of society, the individual and group require significant education and higher level learning. Capacity for synthesis, analysis, and application is essential for human function in a complex world. For a free and democratic world society, the differentiation and integration of information is required for development of wisdom.

The world is a complex matrix of forces which society must internalize. However, the organizational structures in much of society today, including the organization of traditional teacher education, are designed to reduce, rather than to integrate, people and emerging information and knowledge bases. Yet, the benefits of research on such interactive phenomena as matrix organizational structures and interactive videodisc technologies are currently accessible for creating a teacher education college which overtly models a philosophy of human development, organization, and learning which is consonant with characteristics of an interdependent, information society.

Purposes for Education in an Information Society

Conceptualization of the purposes of education for a global, information society demands consideration of these and other interdependent systems which impact on the individual. University teacher education

faculty need to prepare current and future educators to teach their students to assimililate, synthesize, translate, and apply an increasing volume of critical data which is available through information technologies. For information to become knowledge, and for knowledge to be applied for human benefit in an interdependent and frequently dangerous world, past societal demands for basic skills education must be enlightened to expand focus on the higher level learning processes essential for student analysis of phenomenological systems.

The primary educational purpose for an information society is the education of the individual for maximum individual development as citizens in a free, democratic, world society. The need is intense for learning technologies and organizational structures which promote interactive, multisensory, and richly varied opportunities for higher level synthesis and analysis required for decision making in a complex world.

Teacher Education for an Information Age

With instant, world-wide information requiring synthesis and rapid application, traditional means and processes for gathering information have become obsolete. Exposure to single newspaper sources, or response to a single television news program is insufficient for acquisition of knowledge required for continuous global understanding. There is far too much information to process for society to tolerate the past paradigm of linear data processing. Similarly, the traditional linear approaches to teaching have become too restrictive, too time-consuming, and they are incapable of maintaining the attention of students who have are regularly exposed to

appropriate or inappropriate multi-sensory media.

The way teacher candidates are taught has been long accepted as a primary influence on the manner in which they will teach. The current and future world society demands much more skillful and knowledgeable educators who model and teach processes which are accountable for increasing learning efficiency and effectiveness. The contemporary world of multi-media entertainment needs to be effectively incorporated into planned, active learning experiences.

Yet, even with the increasing impact of computer and telecommunications technologies, the norm of instruction across the world remains primarily linear, modestly interactive, and focused on memorization. Classrooms, school systems, colleges of education, and universities continue to rely on inefficient, uninspiring, and ineffective learning environments for student and faculty development.

Although cognitive field theorists have developed a sizable body of research in support of non-linear, multi-sensory, and multiple domain presentations for learning, many of the educational experiences of teacher candidates and teacher education faculty development programs appear to continue to be associationist, lower-level, terms-dominated, and skill-focused. The organizational environment for many teacher education faculties is yet highly departmentalized, with faculty development frequently restricted to individual, non-interactive, sabbatical activities. Multiple, mutually-influencing, variables can be structured to provide important learning opportunities, however. Teacher educators must take the lead in the effort.

Organization Development Technology for an Information Age

Organization Development is a process for applying research of social psychology, management, psychotherapy, and education for the improvement of organizational behavior. Organization development is a term used to describe planned processes for improving human productivity and effectiveness within group settings which are goal-directed. Rational empirical elements of organization development process include an emphasis on the gathering of data, including the human dimension of attitudes and values, into an information and communication system to increase the involvement of every human organization member in conceptualizing purposes, directions, expectations, and appropriate behaviors for improving organizational effectiveness.

While the chosen "strategy" of many administrators and planners in university teacher education, or other organizations, often emphasizes rational empirical or position power approaches to management, organization development extends beyond these issues to analytical concern for the social, emotional, and human factors within the organizational system. Organization development processes are planned, system-conceived, administrative information interventions for increasing the capability of groups and individuals.

Results of research on the positive effects of participatory governance on building constructive norms, mores, behavioral patterns, and organizational goals has been basic to the commitment of organization development to increasing interaction and contact of people in organizational settings. A primary goal of organization development is to teach people improved behaviors

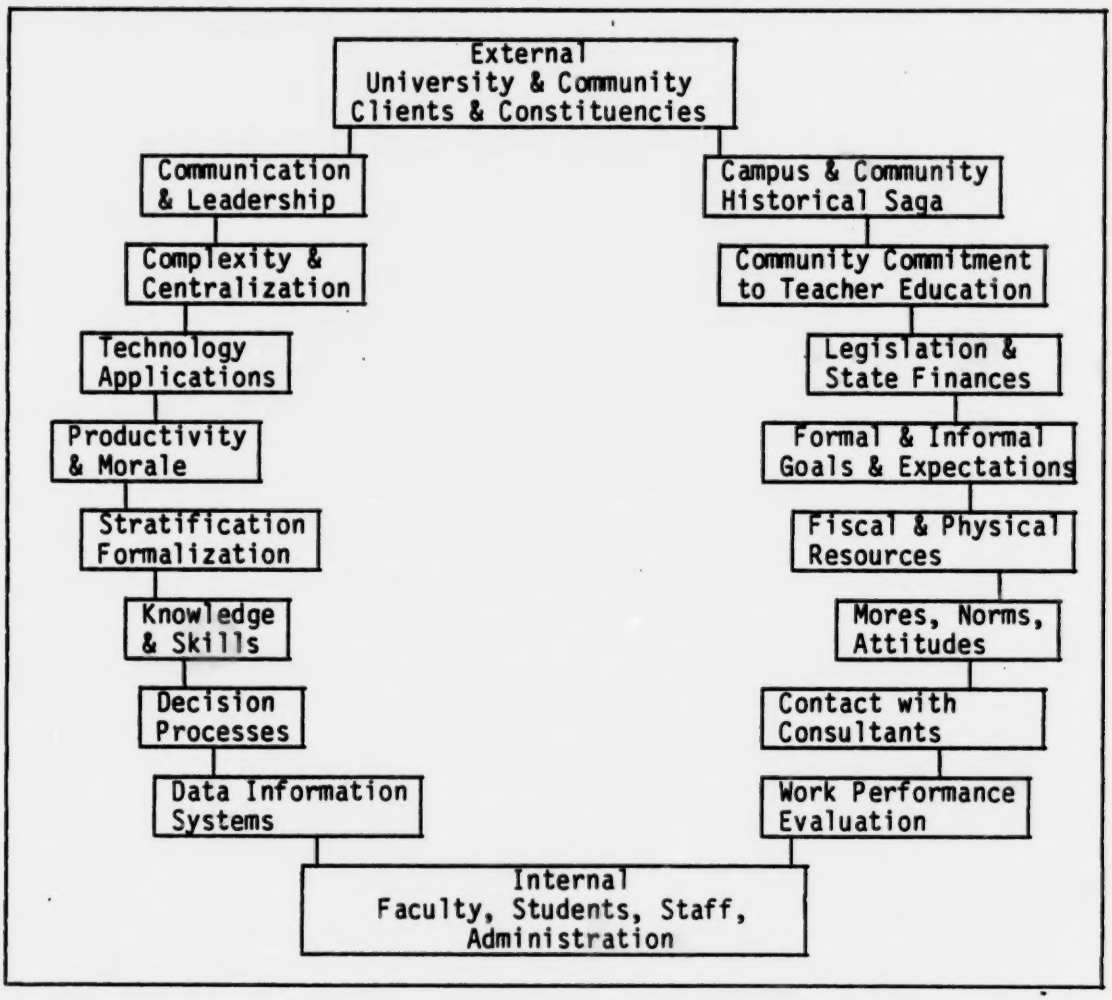
for achieving fulfillment, productivity, and meaning within complex, and frequently conflicting, organizational and institutional frameworks. Organization development is a long-range education plan to improve an organization's awareness and use of overt and covert behavioral goal structures. Goal setting is an essential means for groups to synthesize, apply, and problem-solve. Goal setting allows integration of conflicting variables.

Clearly, organization development has significant roots in education theory and research which has produced teacher education across the world. The cooperative learning environments recommended on the base of contemporary research on the classroom are not unlike the collaborative organizational environments found effective in organization development research in widely varied institutions. Ironically, however, this theory and research has been less commonly applied in American teacher education than in American corporate business.

The organization development process requires strategic planning through surveys of internal organization members and external client systems. College administrators and members examine goals and objectives, considering the match of formal and informal expectations. Attitude surveys, group discussions, participant observation and reporting, budget and work productivity assessment, and outside consultation on external forces were used in the applications of organization development the College of Education and Human Service Professions at the University of Minnesota, Duluth, in which the writers are members. Figure 2 illustrates some of the simultaneous, mutually-influencing variables which are important in teacher education organization development. This set of factors suggests categories of influences

which make significant organizational change difficult to achieve. It is obvious why most change projects focus on the uses of position power and group control, rather than addressing the array of interdependent factors present in complex organizations, such as university teacher education units.

Figure 2. Selected factors in simultaneous mutual influence in teacher education college organizational behavior.



Change plans need not only recognize the mutual interdependence of

these kinds of factors, but influence them. Participatory governance and normative re-education change process, relying on interventions which apply what is known about the socio-psychological factors involved in higher level learning, are required to build motivation suited to a climate for change. Significant change requires change in the mix of values in an organization.

Current and near-future economic, political, international, and technological factors impacting the College need to be assessed and discussed, keeping all College members normatively re-educated on the changing definition of the future of the organization. The communication process in the College at Duluth was designed to expose faculty to each other's aspirations and scenarios on the future of the College. Discovered individual expertise and interest were matched to emerging new tasks, as a deliberate renewal effort. Not only were equipment, materials, and space rearranged, but ad hoc and standing committees were also used to encourage restimulation of relationships among this College of 100 faculty and staff who had generally had long-term interactions over years of service.

Participatory goal setting, inservice in uses of new technologies, and selection of new leaders for increased numbers of small group projects were common. Formal administration of organizational assessment instruments was used to establish data base lines and from which to measure change directions. Later in this paper, positive results of a three year period of planned change are reported.

The relevance of the highly participatory and interactive organization development processes for the current information age is in the potential

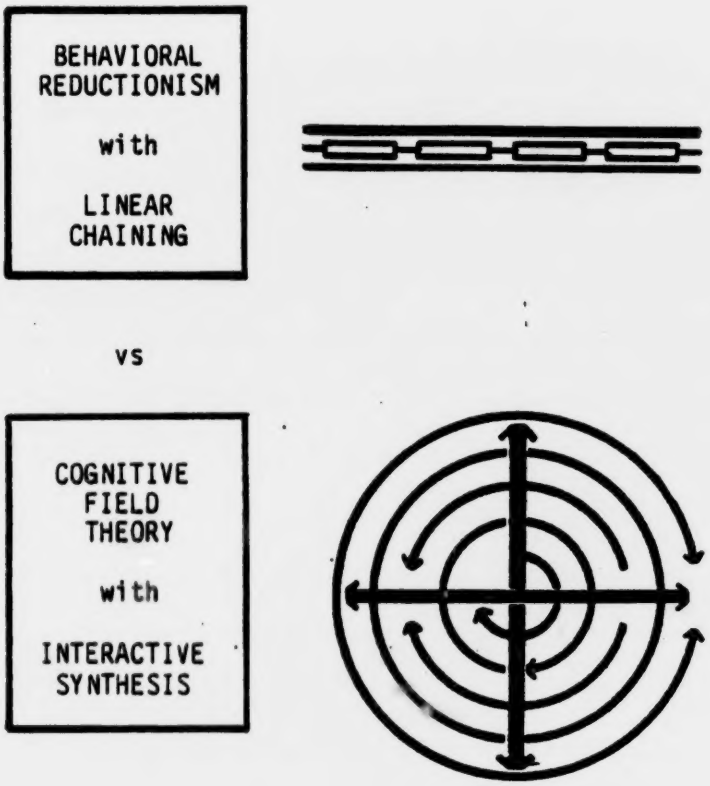
for teaching organizational behaviors which can transfer to assist individuals and groups in their learning to find meaning in a similarly complex, increasingly global, and conflict-rich information society.

A Multi-Sensory, Randomly-Addressable, Non-Linear Learning Technology

An obvious phenomenon of an information age is the availability of multi-media information. Telecommunications, computer resources, and the general technological sophistication of world-wide information exchange have all contributed to a decline of the contemporary individual's preference for entertainment or learning opportunities presented in single media, linear, step-by-step, and behavioral conditioning approaches. The information age is characterized by demand for rapid data presentation and immediate conceptual conclusions. Advances in telecommunications and media provide sophisticated real life display of how the world functions.

Until the advent of the linkage of computer, laser, video, and instructional design--for example in interactive videodisc technology--there were few tools for the educator which could compete with media available in general society. The videodisc, with its 54,400 frames of multi-sensory information, can be managed by laser and computer to provide a learner with a randomly-addressable resource which finally can break out of the exclusively linear limitations of past teaching approaches. Figure 3 suggests the interactive nature of fact, concept, and feeling in cognitive field application in the design of videodisc. Linear chaining, which continues to be the format of programmed instruction and much current microcomputer software, is contrasted.

Figure 3. Contrast of reductionism and cognitive field theory.



Instructional designers can develop videodisc software with cognitive field theory to allow a student to interrupt at appropriate times, to turn to previous or anticipated content, and to use video for life-like simulations. There is capability for split television screen use, with simultaneous display of video, graphics, text, and "talking head teacher" to provide the multi-sensory stimulation which can be especially useful for providing learners with the rich and mutually influencing sets of information necessary for rapid synthesis and gestalt formation. This paper's scope doesn't permit extensive discussion of technical aspects of videodisc

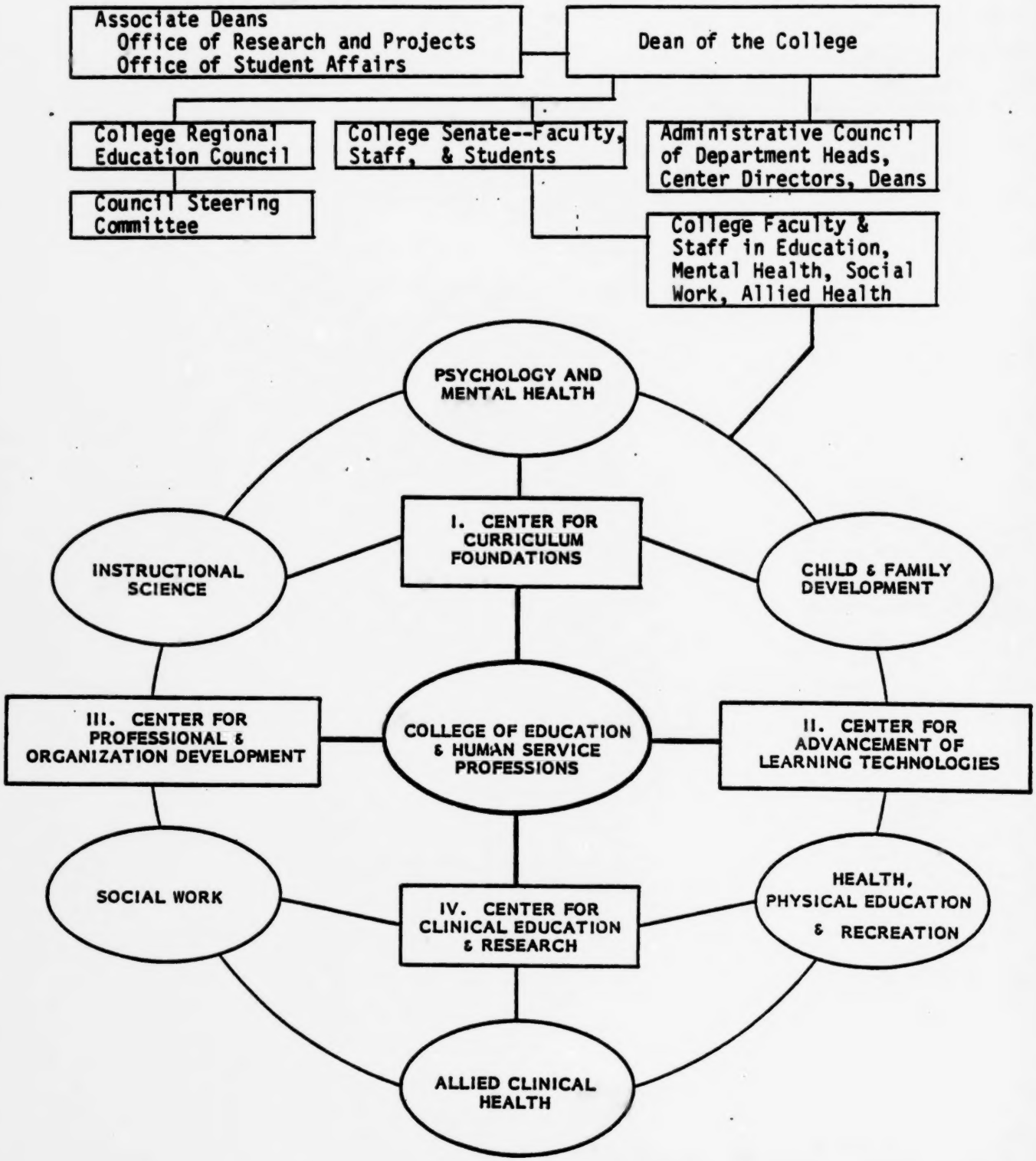
production, but a following section of this paper describes the positive effect on seven teacher education faculty who were assigned to convert half of their professional time in 1984-5 to the design of non-linear core curriculum enrichment software for videodisc delivery.

An essential feature of life in an information age is the requirement for much more rapid assimilation and synthesis of data. The videodisc is a technology which matches the demands of the information age. This technology, which focuses on increasing learner interactivity with learning stimuli, matches in principle with the processes of organization development. The willingness of a teacher education faculty to consider instructional innovation has long been known, however, as a function of organizational and interpersonal norms which either support or suppress change exploration. By itself, interactive videodisc technology is probably too complex, expensive, and mystifying to many teacher education faculty to become important in change process in a college of teacher education. Combined, however, with organization development processes which build faculty confidence in risking new relationships and new ideas, there is exciting potential for videodisc technology as an important variable in education change process.

A Teacher Education College with an Interdependent Systems Model

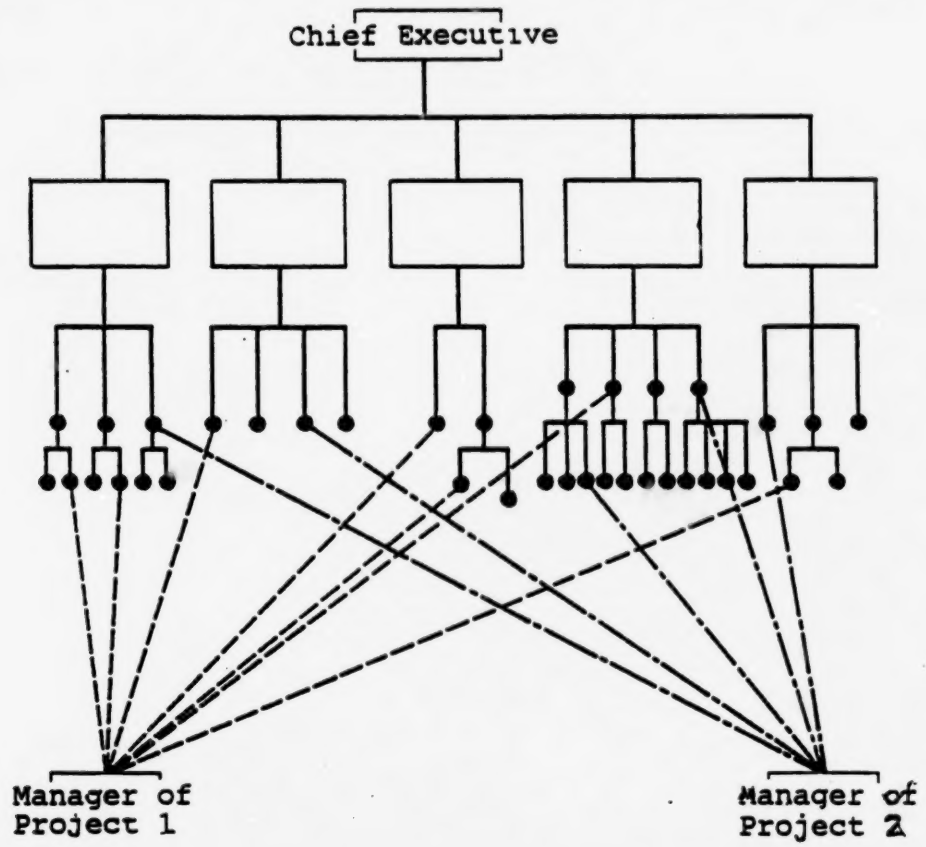
At the University of Minnesota, Duluth, the College of Education and Human Service Professions organized to increase faculty and program interdependence, and particularly a sharing of related department feeling of responsibility for the improvement of teacher education. The organizational structure (Figure 4) employs matrix concepts, with centers across departments.

Figure 4. The organization development matrix for the College of Education and Human Service Professions, University of Minnesota, Duluth.


Associate Deans
Office of Research and Projects
Office of Student Affairs
Dean of the College
College Regional Education Council
College Senate--Faculty, Staff, & Students
Administrative Council of Department Heads, Center Directors, Deans
Council Steering Committee
College Faculty & Staff in Education, Mental Health, Social Work, Allied Health
PSYCHOLOGY AND MENTAL HEALTH
I. CENTER FOR CURRICULUM FOUNDATIONS
INSTRUCTIONAL SCIENCE
CHILD & FAMILY DEVELOPMENT
III. CENTER FOR PROFESSIONAL & ORGANIZATION DEVELOPMENT
COLLEGE OF EDUCATION & HUMAN SERVICE PROFESSIONS
II. CENTER FOR ADVANCEMENT OF LEARNING TECHNOLOGIES
SOCIAL WORK
IV. CENTER FOR CLINICAL EDUCATION & RESEARCH
HEALTH, PHYSICAL EDUCATION & RECREATION
ALLIED CLINICAL HEALTH

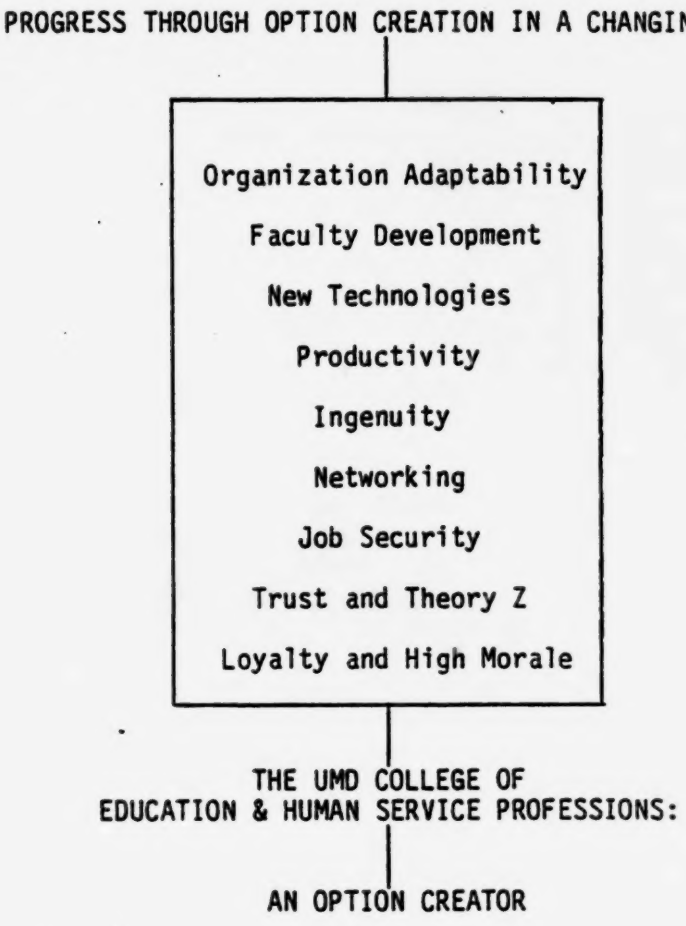
This structuring of six human service education departments, with four development centers for specific long-range change efforts, is an example of a matrix-type structure to increase the contact of organizational members who belong to both departments and centers. Increased contact provides opportunity for exchange of more diverse ideas and for the development of rewarding new relationships which can encourage members to risk new innovative behaviors in line with new goals. The matrix concept brings as well, however, potential for fractured lines of authority, feelings of insecurity, fear of loss of past relationships and power bases, and other factors associated with restructuring of goal behavior. Figure 5 illustrates how an existing organization can create short-term or long-range structures for increasing organizational productivity.

Figure 5. Matrix structure for interdependent projects across departments.



In the case of the College of Education and Human Service Professions at the University of Minnesota, Duluth, the center projects are expected to have several years' duration. Center goals include development of new standards and core curricula (Center I), advancing learning technologies (Center II), re-design of outreach and graduate programs and American Indian Projects (Center III), and clinical education policies and internal research on graduates (Center IV). While all faculty in this College aren't members of departments and centers, over eighty percent have participated in both. Figure 6 summarizes a primary general College goal:

Figure 6. Factors for teacher education structure for option creating goals.



Centers across Departments for Teacher Education Development

The characteristics of two of the College Centers which are making significant uses of organization development and videodisc technologies are described in this section of the paper. The description of the faculty development, core curriculum design, and interdepartmental work in the Center for Curriculum Foundations, is followed by a discussion of the function and current teacher education videodisc production projects of the Center for the Advancement of Learning Technologies. The Center has a current project to increase admission/exit standards for program entrance.

The Center for Curriculum Foundations

The Center for Curriculum Foundations has been an example of an interdependent matrix unit which has been instrumental in faculty development and curriculum development for the improvement of core curricula and admissions standards in teacher education. The goals of the Center include the establishment of new standards and criteria for student admission and exit, new requirements for core curricula in both liberal education and professional studies, enrichment of existing curricula, improvement of student recruitment, advisement, and retention activities, and development of opportunities for students and faculty to increase knowledge and experience in international education. Faculty members in the Center represent all of the human service education departments in the College.

The first core course which has been developed is entitled "Human Diversity." This course was developed through a collaborative effort among several departments in the College. The course incorporates a practicum

experience in a community human service education agency, and an active learning approach in the classroom, to develop knowledge and positive attitudes toward persons with disabilities and multicultural backgrounds. A team of faculty members from different departments cooperate to teach the course. Videodisc enrichment software is in planning for this course.

The second core course, focused on human service systems and processes, is currently in the development stages, following the model used for Human Diversity. A team of faculty is developing the conceptual framework, learning activities, and course materials during the summer of 1985. Following course design, the pilot version of the new course will be tested in 1985-86, with revisions and additions responsive to student and faculty evaluations of the pilot. The course will focus on the need for interdependence and collaboration among teachers and other human service professionals who work in the human service education system to provide education service.

International education will be incorporated into each of the core courses as integrated units, reinforcing concepts such as the need for understanding the interdependence in contemporary world social and ecosystems. Additional core course requirements are planned, including content in human development across the lifespan and foundation courses in the behavioral sciences in liberal arts. Core professional and liberal arts requirements are designed to strengthen academic preparation of graduates.

Center I Results of Interdependent Effort in Change--A Dean's Grant Project

A major effort has been made during the last three years to improve the background of faculty for preparing students to teach disabled learners.

Funding received through a federal Dean's Grant Project enabled the College to involve faculty members in a series of organization development experiences which were designed to enhance faculty awareness, knowledge, and skills about Public Law 94-142, the education for all handicapped student act. The major purpose of the project was to ensure that graduates have an appropriate level of competence to serve the needs of students with disabilities.

The first year of the project included the formation of a nucleus faculty advisory group, composed of one faculty member from each department in the College. In addition, a regional advisory committee was established, consisting of persons with various disabilities and representatives of agencies and institutions providing disabled citizen services in the community. A curriculum assessment project was completed to determine the extent to which faculty members included a study of education for the disabled in courses of study. A series of conferences, seminars, and retreats was used to provide motivation, knowledge, support, and organizational change ideas to faculty throughout the three years of the project.

Another principal thrust of the project was the use of small grants to support interdepartmental collaboration of faculty on research projects and curriculum change activities. Half of the College faculty across all departments have been involved in at least one of these small grant projects during the past three years. The projects ranged from a focus on such specific handicapping conditions as epilepsy to a comprehensive demonstration project with the Duluth city schools where preservice teachers could see a model of collaboration between the special education teachers and regular

classroom teachers. Other projects included far-ranging topics related to improvement of education for exceptional students.

The faculty development aspect of the project was particularly successful. A formal evaluation assessment, with pretest in 1982 and posttest in 1985, showed a positive impact of the project on both faculty and students. Positive change was found in knowledge and sensitivity to the education of the handicapped. Another aspect of this assessment focused on faculty attitudes toward organizational characteristics of the College and its restructuring into a matrix model. Posttests administered in 1985 were statistically compared with pretests of 1982, and data was analyzed to note changes which were significant at the .05 and .001 level.

While the full report of this research is not within the scope of this paper, results are available. In summary, the following significant changes suggest the success of interdependent activities to bring about change. The amount of influence faculty felt they had in decision making, the extent of cooperation perceived in improving the College, and the level of concern that faculty had for understanding the consequences of their professional behavior were noted. The majority of faculty indicated that they had personally experienced an increase in acceptance, trust, support, and confidence in their relationships with other faculty in the College. Attitudes of the faculty toward their departments and the College became much more positive over the three year period, especially in the areas of trust, accuracy of communication, cooperative teamwork, involvement in decision making, empathy among members, and sense of belonging. The mix of faculty produced predictable results. Inservice for faculty is essential to change.

The Center for the Advancement of Learning Technologies

The Center for the Advancement of Learning Technologies (Center II of four) was initiated in 1984 with a principal goal to develop interactive teaching technologies for improvement of formal and nonformal learning effectiveness in diverse settings. Current Center primary activity is focused on the development of interactive videodisc software for core curriculum requirements in programs of study for preparing human service educators.

Center II is the source of stimulating the professions to use learning technologies for improving human development and access to learning opportunities. Center II is the the primary source for software for use in human service professions. In existing education software there is little material designed to assist a College in making a change from teaching by lecture to instruction through alternative technologies and teaching methods.

This Center brings together faculty from education, mental health, social work, and allied health to develop new curricula in learning technologies and new software for use by educators in varied human service education settings. Priority curriculum development goals Center II are listed below:

A. Expand the College's education, mental health, social work, and allied health professional personnel preparation curricula, with experiences and courses focused on the applications of computer technologies in these human service professions.

B. Define, articulate, teach, and evaluate the undergraduate and graduate set of core curriculum and recommended electives. Focus on preparation of graduates more skillful and knowledgeable in the applications of learning technologies and tools of the social sciences.

C. Provide a continuing program of faculty inservice on the uses of emerging technologies and software.

D. Plan with other centers and departments an orderly and politically feasible transition from four-year to more demanding programs of study.

E. Establish and coordinate with other centers and departments workshops, seminars, and outreach courses in technology applications in human service professions.

The software development goals of Center II include the following:

F. Develop microcomputer and interactive videodisc software prototypes which can be used by the human services programs in the College.

G. Develop continuing cooperative relationships for software development with the Digital Equipment Corporation, Minnesota Education Computing Consortium (education software programs), McGraw Hill Company (authoring systems), the University of Nebraska Center (interactive videodisc production), and other resources in and out of the University System.

H. Develop a prototype videodisc product for each of the four human service professional areas of the College.

The basic components of the interactive videodisc learning station, its uses, and applications for rural and urban education needs have been conceptualized as the Center has pursued cooperative project development relationships with the Digital Equipment Corporation, other university networks, and international sites in Asia and Africa.

Features of Interactive Videodisc Learning Technology

Interactive videodisc hardware links the microcomputer and television through the miracle of electronics and laser technology. The result is a television screen with human figures that seem to interact with the viewer. This breakthrough provides a critically needed human means for addressing the impersonal and passive nature of conventional programmed instruction software. Videodisc hardware and production are continuing to decrease in cost. Within this decade this learning technology is likely to be within the reach of many human service professionals seeking a means for widely increasing access to education.

The interactive videodisc technology has strong potential for being used in informal settings with adults who need continuing access to learning. Interactive videodisc technology is the first "high tech" innovation to have the "high touch" capability to interest educators in becoming seriously involved in computer software development. The potential of this technology depends almost entirely, however, on the initiative that instructional designers take in the development of interactive videodisc software.

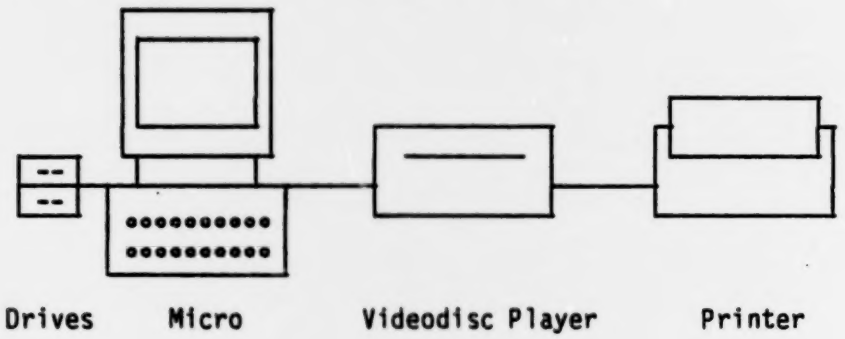
Software needs to be developed which takes full advantage of the

interactive capabilities described in this paper. The capability of the technology will depend on its uses as determined by software yet to be developed. While computer programmers and electrical engineers have produced the hardware with the above capacities, it is the instructional designer who is needed to apply the technology to the human learning needs which can best be addressed.

The Interactive Videodisc Learning System

Interactive videodisc learning systems are currently available from several corporations, such as Digital Equipment Corporation, Sony, IBM, and Panasonic. Other corporations with microcomputer products and videodisc playing equipment also have equipment which can be linked into an interactive videodisc learning system. The diagram in Figure 7 illustrates the components in a portable learning station for one user.

Figure 7. A diagram of a videodisc learning system.



The microcomputer is equipped with digital videodisc control, allowing instantaneous retrieval of any numbered television frame. Current hardware development levels also provide for the microcomputer to have either a

keyboard console (for those who can type) or a touch sensitive monitor screen.

The printer in this system allows learners to have a record of their accomplishments and assignments to take with them. The learning system is becoming less expensive (approximately $5,000 depending upon unit capabilities), and it is portable. It would be possible to have such a learning station in nearly every school room, counseling office, nursing business, physician's office, public agency, or community center. Within the next few years, it is also probable that this type of learning station may become even less expensive and available in a wide variety of homes in the United States.

A commonly cited statistic on videodisc is that one side can store all of the information in one set of Encyclopedia Britannica, with its forty-two million words and over thirty-thousand drawings. Many types of information can be stored on each videodisc. The archives of Canada, for instance, estimated that one side of a videodisc can store forty thousand pages of text, eight hours of narrated film strip presented at two frames per minute, five thousand photographs, and one thousand microcomputer programs. Any of the 54,000 frames on a videodisc side can be instantly accessed through the feature called "rapid, random access."

As an instructional tool, videodisc technology provides an extraordinary array of multisensory features and capabilities for sophisticated individualized instruction. Capabilities to access incredible numbers of slides and graphics, as well as selected sequences, motion sequences, or

individual frames of simulation videotape are important in the teaching of problem-solving. Additional features include self-paced learning options, wide varieties of opportunity for learner choice and experience in simulated consequences of choices, continuing response feedback, and widely varied levels of learning for the same content.

Videodisc instructional design requires a higher level of learning and cognitive conceptualization than required for traditional modes of instructional preparation. For random access to be provided on videodisc, instructional sequences must be planned carefully to allow branching. There is need for educator teamwork to anticipate learner choices, to plan appropriate visual stimuli and learner assessments, and to design content for varied learner levels. The opportunity provided by the challenge of this instructional design task, however, is deeply stimulating and renewing for a teacher education faculty.

Interactive Nature of Faculty Members in Videodisc Production Group

Seven faculty in the College have contributed to the design and development of videodisc software in teacher education during this past year. The impact of this project has intensified and improved interpersonal relationships, communication, scholarly exchange, trust, openness, productivity, and knowledge and skill development.

The essential goal of organization development to build interdependent work groups in the College is well-illustrated by the activities of the seven faculty videodisc production group. This project group of Center II has five-year goals to produce 21 videodiscs to provide enrichment learning

experiences for the emerging core curriculum for preparing human service educators. These discs are categorized generally around the following topics: 1) human service systems helping processes in world culture context, 2) clinical skills in the human service professions, 3) human service behavioral analysis and research skills.

In the videodisc design project the participating faculty from different departments debate instructional design issues, establishing group security for presentation and criticism of ideas for potential use. Questions addressed include discussion of the philosophical underpinnings of the instructional design--will an inductive or deductive design or a combination of both be used? Will there be two or three tracks within a program for students with different learning levels and styles? What are the goals and objectives for various learners?

An example of the task which requires heightened interactivity can be suggested by a preliminary debate about the purposes and audience for a new disc. The group debates the approach to the disc. Questions focus on the basic design. Should the user be plunged into situations and decision making, actually experiencing the characteristics of interactive videodisc as an instructional tool? The decision is made to use first an inductive, problem-solving model with different learner levels.

After the basic design is established, it is necessary to develop specific instructional objectives. The group first brainstorms ideas about the content, rates them in order of importance, and then develops very precise objectives, required for communication with script writers. Objectives and

tasks are charted to guide the developing disc design.

A work flowchart or roadmap of the instructional process is then designed. The flowchart of scope and sequence of content and media outlines only the key elements and relationships to be in a videodisc presentation. There are skills to be learned in flowcharting, as well as in collaborative work with other educators planning disc design. After an introduction, a designer might be involved in a discussion of instructional content and methods of presentation, involving the several choices that will be offered to a learner. Scripts must be written, with sequences managed in what is termed a "storyboard." In each step of the process, debate and consensus ebb and flow, as various viewpoints are checked against the gestalt of design framework. The renewal impact on faculty is powerful.

Because the computer will have to account for every audio, video, graphic, and text piece of the completed disc program, and because the television studio must know precisely which video frames must be put together to be viewed meaningfully when randomly accessed, it is critical that careful planning and "mapping" of the instructional design be accomplished. Clearly, this type of collaborative work requires heightened interpersonal and professional skills. The videodisc production team at the University of Minnesota, Duluth, has indicated frequently that they have never been so "stretched" so willingly to use their basic pedagogical and interpersonal skills. The experience of the faculty in other group goal setting and planning activities of the organization development change process have ready transfer mutually in the videodisc project and in the College. The videodisc production experience transforms how faculty view learning process.

The Department of Child and Family Development--Applied Interdependence

The Department of Child and Family Development is one College subgroup example of a simultaneous mutual influence group. This department has a systems theory philosophy which suggests an ecological network applied to the lifetime development of an individual. The structural organization of the department reflects the ecology of human development developed by Bronfenbrenner.

This ecology of human development is "the study of the progressive mutual accommodation, throughout the lifespan, between a growing human organism and the changing immediate environments in which it lives, as the process is affected by relations obtaining within and between those immediate settings, as well as the larger social contexts . . . in which the settings are embedded" (Bronfenbrenner, 1979). Bronfenbrenner defines the "ecological environment" as having four levels of functioning.

The first level, the micro-system, is made up of all the relationships between the person and his environment in a particular setting. At this level, within the department, students learn about child and adult development in the home setting.

The meso-system, the second level, includes the inter-relationships between major settings in which children and adults are found. An example would be the interaction between the family and educational settings. Students have courses which consider the potential conflicts and support systems between family and more formal educational settings such as elementary schools or day care centers.

The third level, the exosystem, is the extension of the mesosystem to other social systems that do not contain the developing person yet affect the person. One system mediates the effects of another system. In course-work within the department, students consider such topics as the effect of neighborhood institutions, transportation, social systems on the provision of care for the child.

The macro-system, the fourth level, contains all the beliefs and values of the culture and is made up of the principles that guide people's lives. Students in the department consider values and beliefs of mainstream United States and how these affect families and children. To gain perspective, these values are compared and contrasted with those of other contemporary and historical cultures, particularly those of the American Indian.

To study these systems, students learn early in their programs to use critical thinking skills to analyze, synthesize, and evaluate data. Students determine implications of research conclusions on the functioning individual in a family, a family that is further embedded in a national as well as global society.

The function of interrelationship is constantly at work in curriculum design and implementation. Currently, a child studies major to prepare students for licensure in special education, prekindergarten education, and family education is being written. In this major, students move from consideration of normal to atypical development and will interweave family and societal systems parameters in their study. In practicum situations, theory will be extended into practice. The gestalt of the system will be the

reference point for daily decision-making. Students may work in early childhood family education programs; day care, Headstart, or nursery schools; and special education/early childhood sites. In their roles as educators in school or non-school settings, students will serve as support persons to both children and adults. Other examples of department group interactivity include a family studies collateral field for elementary and early childhood majors; a special education mainstreaming concentration for elementary and early childhood majors; a child studies minor for parent educators from home economics.

Underlying these curriculum developments is the collaboration of the faculty. As curricular modules are organized, faculty share viewpoints in open and honest discussion and use a consensus process to arrive at designs that all can accept and support. A participatory style of leadership encourages faculty collaboration to occur, grow, and extend to classroom situations. As faculty model a team approach, students are asked to become part of the problem-solving process and to serve with faculty in planning and implementing ideas.

Centers affect the vitality within the department, through promoting the infusion of global perspectives, human diversity, and advocacy related to the handicapped. Centers promote across department sharing of effective procedures for clinical supervision and an overall plan for continuing education coursework as well as systematic follow-up of graduates. Further, videodisc enrichment is expected to become an integral resource for departmental course offerings, as well as for College core curricula.

Many applications of interactive videodisc technology are possible in the field of education. Learning to read could be facilitated through three-tracks with differentiated learning levels. Programmed instruction with pretests and posttests could be used on individual tracks. Another track could be designed for a language experience approach with video examples of simulated real experiences. And yet another track could be focused on an approach with creative reading with folklore content. Unlike large group instruction, the videodisc application in a reading example could provide the alternatives which could match the varied learning styles and preferences of individual students. Videodisc software in reading could be made available in nonformal education settings, as well as in the formal school program. The flexibility of the multiple tracks on videodisc allows as many possibilities as a creative educator can conceive. There are capabilities for bilingual presentations, with English and another language available simultaneously.

In another potential application of videodisc related to classroom management, future teachers could learn, from one disc track, to identify specific classroom problems in a simulation. On another track of the same disc, these teachers could select techniques to address problems identified. The disc could then show simulations which would be the consequences of teacher selection of classroom management behaviors.

A Climate for Many Changes for an Information Age

Varying organization structures and leadership styles may find means to produce similar responses to change pressures. But, the college of

teacher education in an information age must be flexible and responsive to continuing change.

The means a teacher education faculty has for continuous assimilation, synthesis, analysis, and application of global societal changes is dependent on a system of data information management. It is critical for a self-renewing organization, or a life-long learner, to be in an environment rich in interactivity among significant others who can validate, debate, challenge, and extend concepts and values necessary for accommodating change. This paper has focused on examples of planned interactions of human service educators which have created opportunities for these faculty to find new learning methods, stimulation, renewal, and meaning in interdependence.

Formative research data on changes in faculty attitudes toward themselves, their work, their organization and administration, and toward willingness to try change have indicated that applied organizational development processes have produced positive results. It appears that this College has created a climate for change, which has been extended to projects in centers for core curriculum development and videodisc development. The matrix concept, basic to building interdependent relationships among human service educators in fields of education, mental health, social work, and allied health, has stimulated mutually influencing relationships and projects in centers and departments. The cognitive field theory at the base of organization development and videodisc production has been accepted and applied in this project in creation of a climate for planned change.

An International Challenge in Teacher Education Improvement with Technology

The potential is being explored for international teacher training materials to be developed in which intercultural differences in classroom and teacher behavioral norms can be simultaneously accessed by multiple disc tracks. The College of Education and Human Service Professions at Duluth has initiated a relationship with the Faculty of Education at Chiangmai University in Northern Thailand to replicate organization development processes and to develop extensions of the videodisc software in the Duluth project. Exchanges of individual faculty have led to proposals for interdependent software and curriculum development within an international perspective, and with videodisc development with both English and Thai language tracks for teacher education curriculum enrichment.

Both teacher education units have strongly committed to strengthening the behavioral and liberal education core curriculum areas essential to the improvement of educators. Software developed at Duluth is expected to be analyzed in Chiangmai, with Thai language and culture variations to be developed. The Digital Equipment Corporation, which has supported the provision of Duluth equipment for videodisc delivery of teacher education, has expressed continuing interest in support for establishing a similar project in Chiangmai. Chiangmai teacher education administrators have visited Duluth to explore the applications of organization development in creating a climate for encouraging teacher education faculty to become involved in software development and in core curriculum delivery with videodisc enrichment.

There are also current Duluth plans for developing an American Indian (Chippewa) bilingual teacher education program with Ojibway language on one track and English on the other, as a means of sensitizing bilingual teachers to the language and cultural nuances of both groups. These intercultural projects are examples of those which have resulted from the mix of faculty in collaborating human service education departments with strong commitments to improving education in school and nonschool settings.

Summary

The applications of behavioral and engineering science need to be felt in the transformation of teacher education for the information age. Results of research on organization and learning improvements, reported in organization development and interactive videodisc production studies, have cognitive field theory concepts which are consonant with information age needs. The demand on current global society citizens for rapid assimilation and synthesis of information has continued to increase as telecommunications and computer technologies have expanded the availability of world-wide data. Traditional linear chaining concepts, essential to much current teacher education and school training, and the relatively slower pace with which past decade leaders assimilated information are now obsolete. For both faculty and student development today in teacher education, it is critical that teacher education colleges transform their inservice and preservice programs through the applications of interactive organization structures and learning technologies. These two applications of behavioral and engineering science have been implemented for three-year with positive results in the College of Education and Human Service Professions at the University of Minnesota, Duluth.

REFERENCES

Bronfenbrenner, U. (1979). The ecology of human development. Cambridge: Harvard University Press.

Daynes, R. and Butler, B. (1984). The videodisc book: A guide and directory. New York: Wiley.

DeBloois, M. L. (1982). Videodisc/microcomputer courseware design. Englewood Cliffs, New Jersey: Education Television.

Dick, W. and Carey L. (1985). The systematic design of instruction. Glenview, Illinois: Scott Foresman.

Floyd, S. and Floyd, B. (1982). Handbook of interactive video. White Plains, New York: Knowledge Industry.

Iuppa, N. V. (1984). A practical guide to interactive video. White Plains, New York: Knowledge Industry.

Parsloe, E. (1983). Interactive video. West Sussex, England: John Wiley.